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Conceptual design of a magnetic data aquisition system in fusion experiments

As magnetic fusion draws closer to commercial viability, experiment pulse duration increases and requirements for data acquisition systems change. We present the conceptual design of carrier board for isolated, dual-channel, 2MSPS 18bit ADC modules designed with the requirements of COMPASS-U and other future experiments in mind.

The carrier board was designed to be compatible with the Advanced Telecommunications Computing Architecture (ATCA) standard, an industry standard, used previously on physics experiments. The standard was chosen due to its multiple redundancies and industry proven reliability.

The board will use a Xilinx Zynq UltraScale+ system on a module (SoM) as the main processing element, it was chosen taking processing power, I/O pin count and availability into consideration.

The SoM is responsible for interfacing the ADC modules, pre-processing the acquired data and sending it over to a control PC for storage and for real-time control purposes.

Each carrier board is connected to a management board through a PCI express link transported by the ATCA backplane. The management board contains a PCIe switch responsible for aggregating all the PCIe links into an optical link to the control PC. It is also responsible for receiving timing and trigger signals from the master experiment controllers and distributing them to the carrier boards.

The design fits 24 modules in each carrier board, optimizing the cost per channel. A standard 14 slot ATCA crate is able to fit 12 carrier boards and two redundant management boards for a total of 576 channels per crate.

Minioral

Yes

IEEE Member

No

Are you a student?

Yes

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